

Research Article

Profile composition of knowledge dimension in learning activities during the Covid-19 pandemic in structure and function of plant



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ABSTRACT

The covid-19 pandemic has an impact on the biology learning process in achieving learning objectives. This study aimed to describe the profile of the 4-dimensional composition of knowledge in the Biology learning process during the Covid-19 pandemic on the topic of the structure and function of junior high school plant tissues based on the 2013 Graduate Competency Standards curriculum. This study uses a qualitative research method with a descriptive approach. The population of this study was teachers and students of Junior High School Al Ma'ruf Kudus. The sample of this study was taken using a purposive sampling technique. Collecting data using document observation of learning tools, interviews, and documentation of evaluation of learning outcomes. Data analysis using an interactive model. The results of this study describe the composition of the types of knowledge dimensions in learning the structure and function of plant tissues which include factual, conceptual, procedural, and metacognitive knowledge, with some of the different learning activities based on the characteristics, methods, and learning models in each sub-material discussion. Further research can be conducted to find out how to fulfill the knowledge dimension in biology learning materials carried out during the pandemic.



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INTRODUCTION

Education is an important effort to develop one's potential in mastering science and has a direct effect on the development of human life. The implementation of education is specifically designed through a curriculum that is updated according to existing developments because the curriculum determines the implementation process and competencies that are expected at the end of education. The curriculum is defined as a guide for learning activities that are prepared with careful preparation and complete and detailed planning, in which there are learning objectives, teaching materials or materials, time allocation, learning resources, and

strategies (Paidi et al., 2020). The curriculum is designed to provide a learning experience for students to develop attitudes, skills, and knowledge to produce a learning experience in the form of learning outcomes that describe humans with the qualities listed in the Graduate Competency Standards (GCS) or *Standar Kompetensi Lulusan (SKL)* (Palupi & History, 2018).

Permendikbud No 20/2016 concerning competency standards for secondary education graduates states that students are required to have cognitive abilities, attitudes, and skills by the educational objectives formulated in Bloom's taxonomy model. Bloom's taxonomy in education is a conceptual formulation by looking at learning objectives from two dimensions, namely the dimensions of cognitive processes and the dimensions of knowledge. Bloom's taxonomy which is divided into two dimensions is the result of revision and refinement by Anderson and Krathwohl, namely the cognitive process dimension and the knowledge dimension (Arliantya et al., 2018). Anderson and Krathwohl's taxonomy of cognitive domains is one of the basic frameworks for educational goals, test preparation, and curriculum around the world to make it easier for teachers to understand, organize, and implement educational goals in learning (Gunawan & Palupi, 2012).

Bloom's taxonomy changes from one dimension to two dimensions with the separation of the knowledge dimension and the cognitive process dimension making it easier to understand how the learning process takes place in students. Students acquire knowledge and store it in memory, and then the knowledge that is in the memory will be used to carry out cognitive processes from understanding to creating. The learning process that takes place will include two dimensions, namely acquiring knowledge and using that knowledge to develop cognitive abilities. Knowledge is like fuel and cognitive processes are the engine. The deeper a person's knowledge in a field, the higher his ability to analyze a phenomenon in the field he is involved in. The less knowledge he has, the more difficult it is to analyze something, this is an unavoidable difficulty but an important part of the learning process (Lodge et al., 2018).

The dimensions of knowledge from the results of solving cognitive processes are further categorized into four knowledge, namely conceptual, factual, procedural, and metacognitive (Fauzi, 2017). Biology learning allows these four dimensions to be developed because of the diversity of content in the biological sciences. Biology is the science that studies living things with all their problems. As part of science or Natural Sciences, biology was born and developed through observation and experimentation which are steps in scientific work.

The science learning process is based on scientific work steps, emphasizing providing direct experience to develop competencies to explore and understand the natural surroundings scientifically (Chan et al., 2017). One illustration that can provide explanatory information to students is a demonstration (Fatimah, 2017). So that learning biology is not just memorizing theories that have been contained in books or other learning resources but also needs to interpret biological phenomena that occur around students and contain three important aspects that need to be applied, namely scientific products, scientific processes, and attitudes. The scientific process is meant, for example, through observation, experimentation, and rational analysis.

The current understanding of learning focuses on the active, cognitive, and constructive processes involved in meaningful learning. Likewise in science learning, students must be active in acquiring knowledge when the learning process takes place. Then they can choose the information that is built by their understanding of the selected information. This is a change from a passive view of cognitive learning and a constructive perspective that emphasizes how students acquire knowledge (the knowledge dimension) and how they think (cognitive processes) about what they know during meaningful learning. So before knowing how the cognitive process or way of thinking will be developed, it is necessary to analyze the dimensions of knowledge in the learning process to find out how knowledge arrives at students. The low ability of students in solving questions that only cover the dimensions of factual and conceptual knowledge, as well as evaluation questions that do not cover all dimensions of knowledge are important issues to be analyzed. The weakness of students in solving knowledge-dimensional questions can be caused because teachers rarely apply learning or questions that are by the educational goals formulated in Bloom's revised taxonomy (Assidiq et al., 2017).

Based on the results of observations made at Junior High School (Sekolah Menengah Pertama/SMP) Al Ma'ruf Kudus, information was obtained that in ordinary learning conditions that were carried out directly, the process of delivering learning materials was given by adjusting the time or hours of lessons and the availability of material tools in the laboratory if practicum was needed. This shows that the teacher has tried to pay attention to how to convey effective knowledge to his students. However, if you return to the graduate competency standard (*standar kompetensi lulusan/SKL*) set by the ministry of education, some competencies are mastered by students, one of which is cognitive abilities, both cognitive processes, and dimensions of

knowledge. However, since March 2020 there has been a change in the learning process from direct learning to learning that is carried out remotely or online.

The Covid-19 pandemic that has occurred in Indonesia since the beginning of 2020 has had an impact on the learning process in schools. As a result of this ongoing pandemic, the implementation of learning in schools is carried out remotely or online which is rarely done simultaneously in all elements of education, namely students, teachers to parents (Kurniati et al., 2020). The distance learning process relies on technology as the main medium in carrying out the learning process. However, technology cannot completely replace the role of teachers, lecturers, and learning interactions between students and teachers because learning is not only about acquiring knowledge but also about values, cooperation, and competence.

The government has attempted to update the existing curriculum by issuing an emergency curriculum to education units under special conditions such as the current state of the Covid-19 pandemic. The Ministry of Education and Culture, issued the Decree of the Minister of Education and Culture of the Republic of Indonesia Number 719/P/2020 concerning Guidelines for Curriculum Implementation in Education Units in Special Conditions (Kemnedikbud, 2020). The emergency curriculum designed by the Ministry of Education and Culture is a simplification of the national curriculum. In the curriculum, basic competencies are reduced for each subject so that teachers and students can focus on essential competencies and prerequisite competencies for continuing learning at the next level.

Online learning is not entirely new for some teachers and students in Indonesia. Before the pandemic, several teachers had used several media that made students active independently in acquiring their knowledge. One of them is by using modules. The importance of modules in the learning process because modules can facilitate students in learning independently and face-to-face (Nugroho et al., 2019). According to Suarsana and Mahayukti, (2013), the module is interactive, enabling easy transition of learning content because it can accommodate audiovisual and animation media, and is equipped with tests.

Based on Krismayanti and Elok Sudibyo, (2021) research conducted at Moslem Junior High School 2 Kediri City regarding the effectiveness of the science module in distance learning, the results showed that the module developed by the Junior High School Directorate was effective in terms of the classical completeness percentage of 83.87% and response students related modules developed very well. Teacher creativity, supporting media, and student abilities are needed in the success of the distance learning process.

The research proves that distance learning is not an obstacle if teacher creativity and student collaboration are carried out so that the learning process can achieve the learning objectives set. The characteristics of the effectiveness of learning programs are successful in delivering students to achieve predetermined instructional goals, providing interesting learning experiences, actively involving students to support the achievement of instructional goals, and having facilities that support the teaching and learning process (Rohmawati, 2015).

Based on this, the authors are interested in researching the description of the dimensions of knowledge in the biology learning process with all its limitations during the covid-19 pandemic at Al Ma'ruf Kudus Junior High School, as a school that is considered to be a school located in the city and with poor conditions. Sstudents with similar backgrounds. So the author formulates the research question as follows: how is the description of the dimensions of knowledge during the covid-19 pandemic in the material on the structure and function of plant tissue at Al Ma'ruf Junior High School?

METHOD

This study uses a qualitative research method with a descriptive approach, which fully describes the observed phenomena (Moeleong, 2002). The population of this study was teachers and students of SMP Al Ma'ruf Kudus. The samples of this study were teachers of science in biology subjects and students of class VIII with purposive sampling technique. The study was conducted in September 2020 for the 2020/2021 school year.

The research procedure includes the preparation stage, namely preparing the research design and the research instrument grid. The implementation; stage namely the stage of collecting data in the field by observation, interviews, and documentation. Previously, researchers conducted pre-research observations by collecting data from teachers regarding the form of providing knowledge information to students in learning before and after the pandemic.

Field observations were carried out by analyzing the teacher's learning tools in terms of the Operational Design of Learning Implementation compiled by the supporting teacher whether they had fulfilled the

competencies in the form of 4 dimensions of knowledge according to Anderson and Krathwohl based on the core learning activities in each sub-material. The lesson plans analyzed were lesson plans with learning materials on the structure and function of plant tissues in KD 3.2 and 4.2 Biology/Science class VIII. Learning is done online by utilizing the WhatsApp application as a means of communication in online learning with the help of modules accompanied by video demonstrations of material that students need to do in practice. The module provided by the teacher contains learning materials that are equipped with several explanatory video links, video demonstrations of practical activities that students need to do, and student worksheets or worksheets as a form of evaluation of learning outcomes.

Interviews were conducted to find out if there were obstacles experienced by the teacher in fulfilling the knowledge dimension in the online learning process and also to confirm the suitability of the lesson plans that had been prepared with the ongoing learning process. Documentation is done by looking at learning outcomes and the form of evaluation given by the teacher.

Data analysis using descriptive analysis interactive model consists of four, namely data collection, data reduction, data presentation, and conclusion drawing stage. The data analysis stage uses an interactive analysis model, which describes it as a coherent, systematic discussion and a research report is formed.

RESULTS AND DISCUSSION

Research Results in Reproductive system biology learning materials is divided into 5 sub-materials consisting of the structure and function of plant tissues and their benefits for technology, transportation systems in plants, respiration processes in plants, photosynthesis processes, and various kinds. motion in plants. The results of the observations showed that the learning carried out in class VIII SMP about the structure and function of plant tissue had a different number of activities in each sub-material so that the composition of the types of knowledge also varied based on the learning objectives that had been formulated. Composition The types of knowledge dimensions in science learning in biology material in the chapter structure and function of plant tissue in class VIII, the overall dimensions of knowledge are visible but have different compositions in each sub-material in learning which is presented in [Table 1](#) and Percentage of types of knowledge dimensions in learning materials can be seen in [Table 2](#).

Table 1. Composition of the number of activities per types of knowledge in each sub-material

No	Sub material	Number of Activity			
		Factual (F)	Conceptual (C)	Procedural (P)	Metacognitive (M)
1	The structure and function of plant tissues and their benefits for technology	3	2	0	0
2	Transportation systems in plants.	2	1	0	0
3	Respiration process in plants.	2	1	1	0
4	Photosynthesis process.	1	1	1	1
5	Types of motion in plants.	1	2	0	0

Table 2. Percentage of types of knowledge dimensions in learning materials

No	Knowledge Dimension	Percentage (%)
1	Factual	47
2	Conceptual	38
3	Procedural	10
4	Metacognitive	5

The difference in the composition of the dimensions of knowledge can be This is because the dimension of knowledge is based on the content of learning materials or the content of learning activities ([Darling-hammond et al., 2020](#)). [Table 1](#) and [Table 2](#) shows that learning activities during the learning of the reproductive system material have a different number in each dimension of knowledge, there are 9 activities for factual knowledge which is 47% of all learning activities. Then 7 activities for conceptual knowledge which is 38% of all learning activities, 2 activities for procedural knowledge which is 10% of all learning activities, and at least 1 activity for metacognitive knowledge which is 5% of all over activities.

The results of the observations show that factual knowledge has a greater frequency of accommodation than the total number of learning activities, followed by conceptual, procedural, and finally metacognitive knowledge. A large number of dimensions of factual knowledge is caused by several factors, including the first, namely factual knowledge, which is the knowledge that is concrete or tangible when compared to other knowledge. This is by the opinion of [Athanassiou and Mcnett \(2015\)](#) which states that factual knowledge to metacognitive knowledge has a knowledge structure that has a higher level of abstractness. [Awi and Sukarna, \(2013\)](#) explain factual knowledge has the lowest level of abstraction. Second, factual knowledge only contains facts and terms, besides that it also learns the definitions of a term. According to [Arliantya et al \(2018\)](#) explain that factual knowledge contains pieces of some knowledge without adjusting the information obtained from a broader or systematic perspective. In contrast to the low knowledge structure and relatively simple material content, [Istifarin et al \(2016\)](#) revealed that high factual knowledge shows that the teacher tries to provide a knowledge base to build higher student knowledge.

Subsequent learning activities that developed conceptual knowledge were recorded as many as 7 learning activities. The results obtained were the amount of conceptual knowledge was lower than factual knowledge. The factor that is suspected to be the cause is that the level of conceptual knowledge is more abstract than factual knowledge. [Hurrell \(2021\)](#) stated that conceptual knowledge is knowledge that is more complex and organized. Types of conceptual knowledge contain knowledge of classifications and categories including specific categories, classes, divisions, and arrangements that are used on different subjects, which are more general and often more abstract than knowledge of certain terminology and facts. Principle and generalization knowledge include knowledge of certain abstractions that summarize the observed phenomena. Principles and generalizations tend to dominate more in an academic discipline and are used to study phenomena or solve problems in scientific disciplines ([Mulyani, 2020](#)). Principle knowledge or generalizations tend to be basic ideas that can be difficult to understand because they are not introduced to the whole of the phenomenon under discussion.

Furthermore, conceptual knowledge according to [Hurrell \(2021\)](#) is knowledge of explicit and implicit schemas, models, or theories in different cognitive psychological models. [Istifarin et al \(2016\)](#) also stated associate that schemes, models, and theories show the knowledge that a person has about how certain subjects are arranged and arranged, how different parts or pieces of information are related and related to each other. A systematic way, how these parts function together. Conceptual knowledge is more than just explaining the terminology or the meaning of terms in biology learning, so it also needs to be supported by appropriate learning methods to develop the dimensions of conceptual knowledge.

The learning process on the structure and function of plant tissue materials carried out online has 2 activities in developing procedural knowledge. The low number of procedural knowledge is thought to be caused by; (1) the learning method applied by the teacher is limited by the media because learning is carried out online. The results of the observation showed that the method used was in the form of student practice activities carried out by utilizing the semi-self-instruction module made by the teacher and then the results of the students' practical work were discussed with the teacher and classmates online through the WhatsApp application. The online method makes students less motivated to study the material independently because if they experience problems, students tend to be silent and there is no improvement besides that students have many tasks from other lessons. In line with observations, [Jamaluddin et al \(2020\)](#) revealed the many obstacles experienced during online learning, namely the limited internet network quota, as many unstable internet networks, and accumulating tasks; (2) the results of the observation show that the teacher does not use a learning model that can accommodate procedural knowledge because it is limited to learning media. Procedural knowledge can be trained through learning activities that focus more on students to be more active, one of which is by implementing learning using scientific processes ([Yusrizal et al., 2017](#)).

The lowest development of knowledge dimensions is found in metacognitive knowledge, namely in the learning activities of the photosynthesis process sub-material. The results of the observations show that some of these factors are, firstly, the learning method is inadequate. Based on the lesson plan on the structure and function of plants designed by the teaching teacher, learning activities during the pandemic are less varied. Learning activities tend to be teacher-centered and less interactive between students during the learning

process. According to Siegesmund (2017) metacognitive is about self-reflection, responsibility, and self-initiative as well as setting targets and time management.

The development of metacognitive knowledge not only requires learning methods and assessment forms provided by the teacher but also from students. This is consistent with the statement of Kubat (2018) that metacognitive knowledge is knowledge about understanding the relationship between aspects of individual characteristics, task characteristics, and the use of strategies in learning situations. The results of developing the metacognitive dimension are the attitudes of students. Successful learners are students who can consciously monitor and control their learning. Central to knowledge and self-control are commitment, attitude, and attention, while elements of knowledge and process control are essential knowledge in metacognition and control of behavior.

This can be an assumption of an optimal predictor of learning. In the world of educational research, this hypothesis is typical of a positive correlation between the regulatory process of learners' learning and its learner goals and has a direct impact on the task given. This is in line with the findings of other studies which state that the relationship between metacognitive use is positively correlated with the level of the truthfulness of students' academic tasks (Nett et al., 2012). In addition, the same statement was expressed by Jaleel & Premachandran, (2016) the role of metacognitive can prove whether learning in school can be applied in everyday life.

Second, the results of observations show that metacognitive knowledge is the knowledge that is difficult to apply because it is too abstract (Athanassiou & Mcnett, 2015). Metacognitive knowledge can be improved by applying learning models and methods that accommodate the activities of students to be able to think at higher levels and problem-based learning. Research by Istifarin et al (2016) shows that blended learning in the form of real object learning and web-based, can grow and improve 4 dimensions of knowledge. Activities in blended learning make it seem as if students are carrying out scientific activities, namely observation, and investigation (Permana & Chamisijatin, 2019). According to Sukowati et al (2016) states that metacognitive abilities are achieved from meaningful experiences through scientific activities. Alabdulaziz and Alhammedi, (2021) states that metacognitive knowledge allows students to plan, follow developments, and monitor the learning process.

Metacognitive skills are needed in developing student learning independence, because they must have initiative and awareness in thinking. Malahayati et al (2015) state that metacognitive leads to high-order thinking skills (HOTS) which include active control of cognitive processes in learning. In line with this, the development of learning-oriented towards higher order thinking skills or Higher Order Thinking Skills (HOTS) is a program developed as an effort of the Ministry of Education and Culture through the Directorate General of Teachers and Education Personnel to improve the quality of learning and improve quality graduates (Palupi & History, 2018).

The composition of the four types of knowledge has differences in each sub-material, structure, and function of plant tissue, as seen in Table 1. The difference in composition is thought to be based on the characteristics of the sub-material and learning objectives formulated by the teacher. The concept of the material structure and function of plant tissue can be categorized into two, based on their properties, namely concrete and abstract. Concrete concepts are concepts that are easy to learn because they are concepts that are often observed and can be described, for example, as various kinds of motion in plants. An abstract concept is a concept that is difficult to understand because the process cannot be seen and described, for example, as to how the network works during the photosynthesis process (Takdung, 2015).

The content characteristics of the material can determine the type of knowledge. According to Gunawan and Palupi (2012) reveals that the dimension of knowledge has experienced a shift in the structure of knowledge from the concrete to the most abstract, for example in this topic at sub-chapter of the structure and function of plant tissue and its benefits in technology having the highest amount of factual knowledge in Table 1, because the content of the material contains concrete concepts, such as name, location, and technology that makes use of plant tissue structures. The second factor is the learning objectives or the learning goals. Learning objectives are also a reference for teachers to determine activities in learning. The knowledge dimension can be integrated into the learning objectives so that the teacher can determine the type of knowledge to be achieved after the learning process. Learning objectives are also a reference for teachers to

determine activities in learning, for example, teacher learning objectives are formulated so that students gain factual knowledge, teachers will choose learning activities using pictures, charts, animations, and others (Faisal, 2015).

The learning method used has a role in fulfilling the development of the dimensions of student's knowledge. Learning methods need to be supported by learning infrastructure, the learning media used, and the cooperative attitude of students. The learning process carried out online becomes an obstacle in optimally applying learning methods in developing 4 dimensions of knowledge. This is in accordance with (Jariyah & Tyastirin, 2020) opinion which states that online learning is less supportive in terms of improving skills, online may be able to increase knowledge very well but the effect is very small in increasing skills, besides that, not all disciplines can use online effectively in education. Further research can be conducted to find out how to fulfill the knowledge dimension in biology learning materials carried out during the pandemic.

CONCLUSION

The results showed that learning activities included all four types of knowledge, namely factual, conceptual, procedural, and metacognitive knowledge, but with some different frequencies, namely 9 learning activities for factual knowledge, 6 learning activities for conceptual knowledge, 2 learning activities. For procedural knowledge, and 1 learning activity for metacognitive knowledge. The factors that influence the dimensional differences in the sub-material tips are the characteristics of the content of the material being discussed and the learning methods used. The conditions of the learning process carried out during the Covid-19 pandemic made learning activities take place online so that the learning methods used did not maximize the development of the dimensions of knowledge in students. Further research can be carried out to find out how to fulfill the knowledge dimension in other biology learning materials.

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